This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

QL
461
.C53

BUHR B
a39015 00003786 46

Occasional Memoirs of the Chicago Entomological Society

Vol. I. CONTENTS No. 1

I. Some New Tettigidæ from Madagascar, J. L. HANCOCK
II. A New Species of Gomphus, J. TOUGH
III. Insect Drift on the Shore of Lake Michigan, J. G. NEEDHAM
IV. The Argynnids of North America A. J. SNYDER

CHICAGO
PUBLISHED BY THE SOCIETY
1900

ARTES SCIENTIA VERITAS
LIBRARY OF THE
UNIVERSITY OF MICHIGAN

PRESENTED BY
THE SOCIETY

[illegible]
QL
461
.C53

OCCASIONAL MEMOIRS

OF THE

CHICAGO ENTOMOLOGICAL SOCIETY

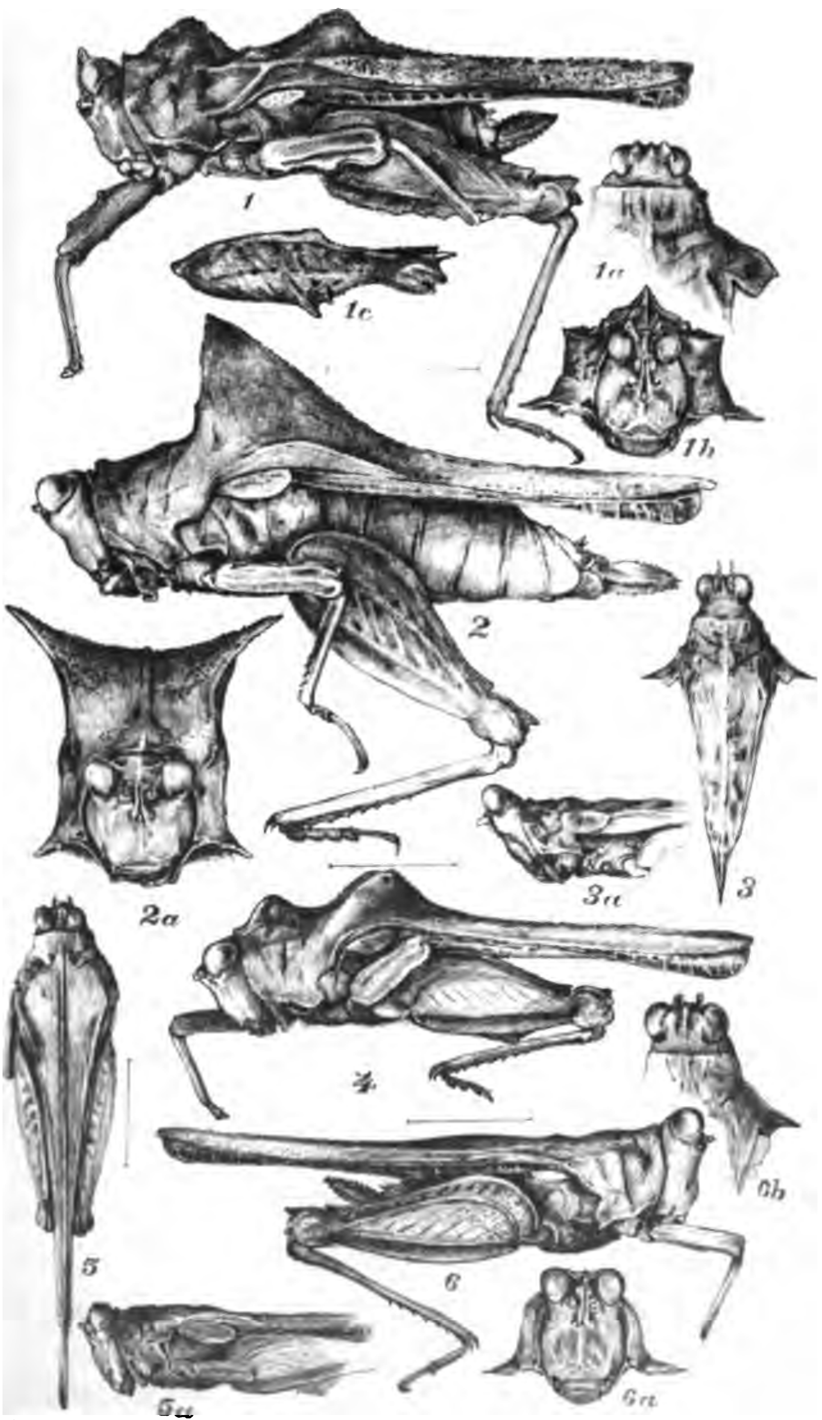
EDITED BY
J. L. HANCOCK AND O. S. WESTCOTT

VOLUME I, No. 1

CHICAGO
CHICAGO ENTOMOLOGICAL SOCIETY
1900

MU

The Lakeside Press
R. R. DONNELLEY & SONS COMPANY
CHICAGO



J. [illegible]ANCOCK, DEL.
CHICAGO PHOTO-GRAVURE CO

UNIV. OF MICH.

VOLUME I MARCH, 1900 NUMBER 1

OCCASIONAL MEMOIRS
OF THE
CHICAGO ENTOMOLOGICAL SOCIETY

SOME NEW TETTIGIDÆ FROM MADAGASCAR.

JOSEPH LANE HANCOCK.

Since the appearance of Serville's *Histoire Naturelle des insectes orthoptères* (1839), in which were described two species of *Tettigidæ* from Madagascar, nothing has been added to the knowledge of these interesting *Orthoptera* from that remote island. Serville's first species, *Tetrix lucifer*, and his second species, *Tetrix belphigor*, the latter of which Bolivar could not conveniently classify, constitute, with the present contribution, all that is known of the *Tettigidæ* of Madagascar.

From the continent of Africa eighteen species have been described by various investigators, and these have been brought together in the essay of Professor Bolivar (1887). At the same time two species, *Pterotettix andrei Bol.* and *Paratettix cinereus Bol.*, from Nossi Be, an island northwest of Madagascar, were described by him. The present contribution is the result of a study of some thirty-nine specimens of *Tettigidæ* from northeastern Madagascar, Bay of Antongil, which were most generously furnished by Mr. Malcolm Burr, of East Grinstead, England, and now form a part of the present author's collection. From this series five new genera, comprising six new species, have been made out. As might be expected from an island so rich in remarkable types of animal life, some forms of *Tettigidæ* are represented which are fully as interesting as any heretofore known to science. In the genus *Notocerus*, for example, we are reminded of the *Membracidæ*, especially of the genus *Ceresa* (*Am. et Serv.*), for the reason that the humeral angles of the pronotum are elevated and modified into acute horns. In *Tetticerus* the vertex is corniform on each side, the median carina of the depressed pronotum being provided with two well-developed cristate gibbosities. *Oxynotus* has the apical process of the pronotum, and the posterior inferior margin of the lateral lobes externally spined, giving the body a spear shape, and the only species, *hastatus*, is devoid of elytra and wings. This will suffice to show a few of the remarkable structural peculiarities presented, but for detailed description the reader is referred to succeeding pages and the accompanying plate.

TETTICERUS GEN. NOV.

Body rather large, rugose, gibbose. Head but little exserted; vertex anteriorly corniform on each side; eyes rather small; face scarcely oblique; maxillary palpi apically compressed; frontal costa moderately furcate between the antennæ; antennæ slender (fragmentary), inserted considerably below the anterior inferior border of the eyes; posterior ocelli situated scarcely in front and on a plane with the inferior border of the eyes. Pronotum anteriorly truncate, posteriorly long, subulate; dorsum rugose, strongly gibbose, depressed between the shoulders; humeral angles acutely angulate, conspicuously compresso-carinated; posterior inferior margin of lateral lobes widely laminato-dilated and on each side formed into small nearly rectangular lobules, posteriorly obliquely truncate, serrulate, the external angle subacute; the posterior inferior lateral sinus rather deeply and somewhat angularly incised, the sub-humeral lateral margin widely arcuate for the reception of the elytra. Elytra small and narrow; wings well developed. Posterior tibiæ feebly multispinose, first and third articles of posterior tarsi subequal in length.

Type, *Tetticerus bigibbosus*, from Madagascar, herein described.

TETTICERUS BIGIBBOSUS SP. NOV.

Plate 1, Figure 1,—1*c*.

Body rather large, ferruginous or fuscous, rugose, strongly bigibbose, sometimes covered with extraneous lichen growth. Face nearly perpendicular, feebly sinuate; vertex in front, on either side, corniform; the horns, which to all appearances are modified frontal carinæ, somewhat acute, elevated about one-fourth the height of an eye, and very slightly encroaching on the eye, sloping off abruptly behind, carinated in front, convexo-concavely sloping toward the middle, forming the concaved frontal margin of the vertex. As viewed in front the frontal margin at the deepest point is on a little lower plane than the superior border of the eyes and very deeply concave between the horns. Here the eyes are separated a little wider than the breadth of one of them. Eyes rather small; frontal costa between the eyes strongly carinated, exceptionally obscure, advanced about to their front borders, following their contour. The frontal costa bifurcates between the eyes at about their lower fourth, the branches in their descension for the first half rather nearly approximate, in the last half to the median ocellus separated appreciably further; in profile between the antennæ scarcely protuberant; antennæ slender (in fragmentary condition), viewed in profile inserted at a point considerably below and on a line with the anterior third of the eyes. Pronotum anteriorly truncate, posteriorly long, subulate, strongly carinated, dorsum depressed, rugose, gibbose, with two pronounced obtuse-angulate longitudinally cristate gibbosities in the median line. The first gibbosity appears between the anterior lateral sulcations a little behind the anterior border, its anterior margin a little convexly sloping to the plane of the dorsum, the posterior margin sloping, substraight, crenulate near the base. The second gibbosity is at about an equal distance behind the humeral angles and a little behind the origin of the posterior femora, and is scarcely larger than the first. The base of the first is enlarged posteriorly; in the second it is very thick, spreading laterally into ridges, where, on either side, in their lateral slope, they are interrupted by a smaller and less elevated obtuse tubercle seen clearly in sectional view. Median carina of pronotum distinct, riding over the median gibbosities, where it becomes cristiform, near the anterior border obsolete, but slightly conspicuous in the hollow between the gibbosities and in its course posteriorly over the apical process, where it is straight and crenulate; anterior lateral carinæ short, distinct and parallel; dorsum between the shoulders depressed, midway between the humeral angles and median carina on the dorsum provided with short curved, acutely raised, denticulate-nodulate carinæ; humeral angles strongly pronounced, sharply compresso-carinated, the margins denticulate, posterior lateral carinæ distinct, crenulate along their margins, and here at stated intervals interrupted by little enlarged denticulate tubercles; lateral lobes of pronotum inferiorly widely dilated laterally, thinly distended horizontally, on each side formed into a small oblique nearly rectangular lobule, posteriorly obliquely truncate, dentate, anteriorly a little convexed, the apex externally acuto-angulate produced. Wings extended nearly as far as the apex of pronotum. Elytra very minute, narrow, externally punctate; the sub-humeral lateral margin receiving them, broadly arched. Anterior femora rugose, above strongly carinated, formed into a little raised angulate lobe behind the middle, and a second one, less distinct, before the extremity, the outer two-thirds denticulate, below carinated, minutely crenulate, with two very feeble lobes dividing the femora nearly into thirds; second femora carinate, above triundulate, below with two conspicuous somewhat conical lobes dividing the femora nearly into thirds; posterior femora rugose, margins a little crenulate, at the middle of the external pagina furnished with a strongly obliquely projecting tooth, followed closely behind by a much smaller one; superior carina strongly cristate, a little more elevated at the middle, the apical half suddenly reduced; margin below a little undulate and crenulate; posterior tibial carinæ crenulate, multispinose; first article of the posterior tarsi equal to the third in length; the first pulvillus a little shorter than the second and third, which are nearly equal in length and substraight below.

Length body, ♀, 15-17 mm.; pronot., 17.5-18 mm.; post. fem., 9-9.5 mm.; total length, 18.5-19 mm.

♂, 13-14 mm.; pronot., 17 mm.; post. fem., 8 mm.; total length, 17.5-18 mm.

Five males and eight females in my collection.

Locality, northeast Madagascar, Bay of Antongil. January 4, Mocquerys, Malcolm Burr.

A small fragment of moss, which in all probability served as food, was found adhering to the underside of the body of one of the specimens.

NOTOCERUS GEN. NOV.

Body large, smooth, granulose, bicornute. Head not exserted, crown shortened; eyes very prominent, pedunculate, in profile a little longer than high; vertex broad truncate anteriorly, not advanced so far as the eyes, transversely carinated, a little depressed and subfossulate on each side between the eyes, mid-carina almost wanting, appearing only very slightly at the extreme front margin; frontal costa narrowly and evenly furcate between the antennæ, where it is a little protuberant; antennæ in profile inserted scarcely in front of the angle formed by the anterior inferior border of the eyes; posterior ocelli situated between the middle of the eyes, in profile not at all visible; maxillary palpi apically depressed; anterior margin of the sternomentum* broadly excavated for the reception of the mouth parts. Pronotum enlarged, anteriorly truncate, posteriorly long subulate, humeral angles enlarged, strongly elevated and longitudinally compresso-produced into an acute spinose horn on each side; dorsum between the horns longitudinally roundly elevated, but not so high as the apices; between the apices concave; posterior lateral carinæ serrulate crenulate; anterior prozonal carinæ short, almost obliterated, converging posteriorly; the curved ante-humeral carinæ but slightly marked, they being continuous with the anterior marginal carinæ of the humeral horns; posterior inferior margin of lateral lobes on each side a little obliquely produced outward, externally acute angulate, posteriorly obliquely truncate; the inferior lateral sinus above the subrectangular lobule deeply and angularly incised; the sub-humeral margin broadly depresso-arcuate for the reception of the elytra; elytra present; wings fully explicated. Posterior tibial carinæ serrulato-multispinose, the first and third articles of the posterior tarsi equally long.

---

*An original term to designate the anterior modification of the prosternum.

Type, *Notocerus cornutus.*

Holocerus (Bolivar)?

NOTOCERUS CORNUTUS SP. NOV.

Plate 1, Figure 2, *2a.*

Body large, testaceous, sometimes edged or tipped with rufus or spotted with fuscous, rather smooth, granulose or minutely punctate, bicornute. Crown shortened; vertex very wide, nearly twice the breadth of an eye; middle feebly carinated anteriorly; front border transversely carinated, truncate, angulato-rounding laterally into sides, advanced to about the anterior fourth of the eye, a little fossulate on each side of the mid-carina between the anterior half of the eyes, and a little obliquely depressed forward. Posteriorly the crown is transversely very little ampliate and widened. Frontal costa above between the eyes roundly sloping obliquely forward, suddenly furcated about the middle of the eyes, the branches moderately separated and parallel in their descension to the median ocellus; in profile between the antennæ obtusely protuberant and scarcely advanced beyond the eyes; face below oblique; eyes subpedunculate, very prominent; antennæ slender (in fragmentary condition), inserted scarcely below the anterior inferior border of the eyes. Pronotum anteriorly truncate, posteriorly long subulate; dorsum between the shoulders largely and roundly elevated, the humeral angles highly elevated and produced laterally on each side into a strongly pronounced acute horn, which is directed upward and outward, somewhat longitudinally compressed at the base; in the female the apices separated about nine millimeters; dorsum between the horns transversely a little concaved, longitudinally rather suddenly sloping in front, behind more gradually inclined and broadly depressed; median carina of pronotum scarcely distinct, continued over the elevated dorsum, but in front near the anterior border a little elevated, backward in its posterior course over the pronotal process straight, anterior lateral carinæ nearly obliterated, posterior lateral carinæ crenulate; lateral lobes of the pronotum inferiorly a little obliquely produced outward, the subrectangular lobe on each side at the posterior inferior portion is obliquely directed and obliquely truncate posteriorly, the external angle acute. Elytra of moderate size, externally granulate punctate, apex subacuminate, situated in the broadly arched sub-humeral sinus; wings extended nearly or about to the apex of pronotum. Anterior and middle femora rather slender, carinæ straight; posterior femora simple, first half of superior carina a little more cristate, genicular spine rather long, acute, tibial carinæ denticulate and multispinose, first and third articles of posterior tarsi about equal in length, pulvilli equal in length, the first obtuse below, the other two broadly angulate.

Length body, ♀, 20-21 mm.; pronot., 19-20 mm.; post. fem., 9-9.5 mm.; entire length, 19.5-21 mm.

♂, body, 15 mm.; pronot., 18 mm.; post. fem., 8 mm.; entire length, 19 mm.

Locality, northeast Madagascar, Bay of Antongil. January 4, Mocquerys.

Seven females, five males, and two nymphs in my collection. From Mr. Malcolm Burr.

Serville, in his *Hist. Nat. des. Orth.*, p. 758, describes a species from Madagascar as *Tetrix lucifer*, which doubtless has some characters in common with the preceding. It is described as having the humeral angles enlarged and spined, and the last article of the posterior tarsi large, much longer than the combined length of the two preceding. For this species Prof. Ignacio Bolivar* proposed the generic name *Holocerus*, but he had not seen the insect in nature. It was placed among the *Metrodoræ*.

*Essai *Acrid. de la Tribu des Tettigidæ, in Ann. Soc. Entom. Belgique, p. 58.*

HYBOTETTIX GEN. NOV.

Allied to *Notocerus.* Body moderately large, rather narrow, smooth, granulate, unigibbose and bicornute. Head not exserted; eyes prominent subpedunculate, a little longer than their height; crown very short, anteriorly distinctly obliquely depressed and a little fossulate on each side between the eyes; posteriorly widened; vertex broad; front margin transversely convexed, not advanced so far as the eyes; frontal carina of vertex obliterated at the middle, appearing only on either side at the inner border of the eyes; mid-carina wanting, the frontal apex depressed, obtuse, and obliquely sloped off; frontal costa furcate between the antennæ, the branches rather widely divergent, in profile roundly protuberant, projecting considerably in front of the eyes; antennæ inserted very little in front of the angle formed by the anterior inferior border of the eye; posterior ocelli situated between the middle of the eyes, scarcely visible in profile. Antero-dorsal margin as well as the anterior margin of the lateral lobes of the pronotum a little convexed, posteriorly long subulate; dorsum anteriorly over the prozonal area somewhat constricted and elevated into a median rounded cristate gibbosity; humeral angles enlarged, elevated, and on each side produced outward and upward into a longitudinally compressed angulate horn; the dorsum between the horns largely and roundly elevated; median carina distinctly elevated, anteriorly becoming cristate as it passes over the gibbosity, and on the elevated dorsal portion between the horns it is distinctly elevated barely higher than the apices; posteriorly over the pronotal process it is less distinct; posterior lateral carinæ serrulate, carinæ in front of the shoulders obliterated, anterior lateral carinæ nearly obsolete, short, and converging behind; posterior inferior margin of lateral lobes on each side a little obliquely angulate produced outward, posteriorly obliquely truncate, the subrectangular lobule considerably broadened at the base; the inferior lateral sinus above the lobule obtuse angulate incised, the sub-humeral lateral margin gracefully arched for the reception of the elytra. Elytra present; wings perfectly explicated. Posterior tibial carinæ multispinose, the pulvilli of the first article of the posterior tarsi subequally long, the first rounded below.

Type, *Hybotettix humeralis*, here described.

HYBOTETTIX HUMERALIS SP. NOV.

Plate 1, Figure 4.

Body somewhat narrow, smaller than *Notocerus*, fuscous, smooth, minutely granulato-punctate, unigibbose and bicornute. Head not exserted, above on the crown very short, anteriorly depressed between the eyes, obtusely sloping forward, posteriorly widened; vertex widened equal to nearly once and a half the breadth of an eye, depressed and a little fossulate on each side between the middle of the eyes, frontal carina convexed, partly obliterated in the middle, not advanced so far as the eyes, appearing on each side of the vertex as little elevated latero-frontal carinæ rounding into the sides, mid-carina wanting; frontal costa scarcely carinate above, between the middle of the eyes furcate, the branches diverging considerably between the antennæ, in profile distinctly and roundly protuberant, and advanced a little in front of the eyes; face oblique below; eyes very prominent, hardly pedunculate, viewed from the side considerably longer than high; antennæ slender (in fragmentary condition), inserted a little in front and scarcely below the anterior inferior border of the eye. Pronotum anteriorly very little convexed, the antero-dorsal margin, as well as the anterior margin of the lateral lobes, little convexed, posteriorly long subulate; dorsum constricted near the anterior border and strongly elevated into a rounded median longitudinal crested gibbosity; humeral angles elevated, longitudinally compressed, formed into an angulate horn on each side, directed upward and outward; dorsum between the humeral horns strongly and roundly elevated, here the median carina very distinctly elevated barely higher than the horns, and on either side of the median summit transversely a little concaved; in front and behind the dorsal interhumeral elevation between the carinæ gently sloping and depressed, posteriorly the dorsum depressed and the median carina scarcely distinct and straight; the little anterior lateral carinæ very short, thin subobsolete lines converging posteriorly, posterior lateral carinæ serrulate; the posterior inferior border of lateral lobes of pronotum scarcely dilated, a little obliquely produced, the external angle of the subrectangular lobule acute, posteriorly obliquely truncate. Elytra rather small, externally minutely punctate, apex rounded, inserted in a broadly arched sub-humeral sinus; wings extended very nearly to the apex of the pronotum. Anterior femora rather slender, carinæ straight; middle femora a little enlarged and shortened; posterior femora simple, posterior tibial carinæ multispinose, first article of the posterior tarsi with the pulvilli equally long, the first rounded below, the second subrounded, the third acute.

Length body, ♂, 12 mm.; pronot., 16 mm.; post. fem., 7 mm.; entire length, 17.5 mm.

Locality, Bay of Antongil, northeast Madagascar; Mocquerys.

A single male specimen of this very distinct species in my collection, received from Mr. Malcolm Burr.

GENUS TELMATETTIX HANCOCK.

TELMATETTIX BURRI SP. NOV.

Plate 1, Figure 5, 5*a*.

Closely allied to *Paratettix meridionalis Rb.* Body slender, plain granulate, cinereo-fuscous. Vertex narrow, a little more than half the breadth of an eye, widening a little posteriorly on the crown, the front margin truncate, on each side transversely concave, minutely rounding laterally into short carinæ, the front border scarcely advanced as far as the eyes, middle distinctly carinate, longitudinally sulcate on each side between the eyes; frontal costa distinct, narrowly furcate a little above the middle of the eyes, the branches subparallel in their descension between the antennæ, when viewed from the side convexly protuberant; the face below feebly sinuate and declivous; eyes moderately large; antennæ slender (fragmentary), inserted close to the anterior inferior margin of the eyes. Pronotum anteriorly truncate, posteriorly long subulate, dorsum rather depressed, between the shoulders transversely a little convexed; median carina rather distinct, obliterated close to the anterior border between the anterior carinæ, a little further back elevated; the pronotum a little constricted in front of the shoulders; anterior prozonal carinæ barely distinct, short, and parallel; lateral lobes bisinuate posteriorly, the inferior margin not dilated, the posterior inferior angle rather narrow obtuse angulate. Elytra oval, externally punctate, apically rounded; wings extended considerably beyond the apex of pronotum. Middle femora rather slender, carinæ substraight; posterior femora simple, slender, first article of posterior tarsi having the first two pulvilli spinose and equal in length, the third substraight below and equal to the combined length of the first and second.

Length body, ♂, 10 mm.; pronot., 11 mm.; post. fem., 5.5 mm.; entire length, 15 mm.

Locality, Bay of Antongil, northeast Madagascar. January 4, Mocquerys.

One male in my collection, presented by Mr. Malcolm Burr, in whose honor I have named the species.

Telmatettix, Hancock, *Synopsis of Subfamilies and Genera of North American Tettigidæ in Psyche*, January, 1900, page 7.

OXYNOTUS GEN. NOV.

Body small rugose, subnodulose, cicatrose. Head a little exserted, compresso-elevated, occiput oblique, but little covered by the dorsum of pronotum; face strongly oblique; eyes prominent subglobose; vertex subnarrower than an eye, the front border narrowed, advanced scarcely as far as the eyes; frontal costa attenuate, sulcate; posterior ocelli situated a little below the middle and between the eyes, not visible in profile; antennæ inserted scarcely in front and below the anterior inferior border of the eyes; maxillary palpi depressed apically. Pronotum anteriorly truncate, posteriorly acutely spinose at the apex, dorsum depressed; posterior inferior margin of the lateral lobes widely dilated and externally acutely spinose, the remaining portion behind the spine obliquely truncate, serrulate; the inferior lateral sinus above the posterior angle rather deeply and angularly incised, the upper margin of the sinus continued backward longitudinally substraight, obliterating the sub-humeral lateral sinus. Elytra and wings absent. Posterior tibial carinæ multispinose, first and third articles of the posterior tarsi subequal in length.

Type, *Oxynotus hastatus*, here described

OXYNOTUS HASTATUS SP. NOV.

Plate I, Figure 3, 3*a*.

Body small, virido-testaceous, or fuscous, subnodulose, rugose, cicatrose; eyes and crown strongly elevated above the plane of pronotum. Vertex a little narrower than an eye, obliquely depressed forward, sulcate on each side of the mid-carina between the anterior half of the eyes, the anterior border narrowed, concaved, furnished with little short oblique rounded carina on each side, scarcely advanced as far as the eyes, the median carina of vertex projecting very slightly, posteriorly the occiput scarcely convexed, declivous and very little covered by the anterior margin of the pronotum; frontal costa attenuate, narrowly sulcate, the branches imperceptibly separated, in profile scarcely sinuate between the eyes, a little protuberant between the antennæ, but scarcely projecting as far as the anterior border of the eyes; face below strongly declivous; eyes moderately large, very prominent and globose; antennæ slender (incomplete), inserted a little below the anterior inferior border of the eyes; maxillary palpi depressed apically. Pronotum hastate, anteriorly truncate, the posterior process rather suddenly reduced, the apex distinctly spinose; dorsum depressed, subnodulose, rugose, cicatrose, between the shoulders rather narrow, and here on the dorsum on each side presenting a longitudinal short rugose elevation; in front of the shoulders provided with obliquely crossed sulcations; posteriorly on the dorsum two pairs of obscure rugose subnodulose elevations; median carina rather distinct and strongly flexuous, posterior lateral carinæ rather indistinct with a second carina visible just inside, taking nearly the same parallel course; humeral angles but little pronounced, carinated, the anterior prozonal carinæ short and converging, the part between a little concavely depressed; the inferior margin of the lateral lobes widely dilated, on each side produced into a distinct spine strongly projecting laterally, which is little wider at the base, the anterior margin of the spine obliquely substraight, posteriorly transversely straight, the remaining little obliquely truncated margin of the lateral lobe behind minutely dentate; the posterior inferior lateral sinus above the posterior angle deeply incised, the sub-humeral margin above and at the side longitudinally nearly straight, there being no sub-humeral sinus and no elytra or wings. Anterior femora rather slender, carinæ straight; middle femoræ rather slender, carinæ very little reduced in middle, substraight; anterior and middle tibiæ black; posterior femora rather slender, first and third article of posterior tarsi equal in length, the first and second pulvilli subacute, equal in length, the third a little longer, straight below.

Length body, ♂♀, 10.5 mm.; pronot., 8.5-9 mm.; post. fem., 6.5-7 mm.; entire length, 10-10.5 mm.

Locality, northeast Madagascar, Bay of Antongil. January 4; Mocquerys. Seven males and two females in my collection, contributed by Mr. Malcolm Burr.

CRYPTOTETTIX GEN. NOV.

Body moderately large. Head not appreciably exserted, a little compresso-elevated; eyes prominent; vertex not advanced so far as the eyes, fossulate on each side of the mid-carina between the eyes; frontal costa furcate, the branches rather narrowly separated; posterior ocelli situated between the middle of the eyes, not visible in profile; antennæ inserted scarcely below and in front of the anterior inferior border of the eyes. Pronotum anteriorly truncate, posteriorly prolonged subulate, dorsum depressed between the shoulders, rather narrow; posterior inferior margin of lateral lobes externally produced, spinose, the portion behind the spine obliquely truncate; inferior lateral sinus above the posterior angle rather deeply and angularly incised, the posterior margin of the lateral lobe above the inferior sinus depresso-arcuate for the reception of the elytra. Elytra present; wings fully explicated. Posterior tibial carinæ multispinose, first and third articles of posterior tarsi subequal in length.

Type, *Cryptotettix spinilobus*, here described.

CRYPTOTETTIX SPINILOBUS SP. NOV.

Plate 1, Figure 6,—6*b*.

Body moderately large, testaceous, a little infuscate on lateral lobes. Head a little compresso-elevated. Vertex quite broad, wider than an eye, the front border not advanced so far as the eyes, subtruncate, the front furnished with little short carinæ, rounding into sides, mid-carina distinctly elevated, rounding and a little projecting in front, insensibly joining the frontal costa, posteriorly becoming obsolete on the occiput, between the eyes on each side of mid-carina longitudinally fossulate, occiput scarcely convexed, declivous, but little covered by the pronotum; frontal costa narrowly furcate, the branches nearly parallel, in profile a little protuberant between the antennæ; the face below moderately oblique. Eyes prominent, subglobose; antennæ slender (incomplete). Pronotum anteriorly truncate, posteriorly rather long extended, subulate, dorsum plain granulate, transversely depressed between the shoulders and narrow, posteriorly a little subtectiform, in front of the shoulders furnished with slight oblique rugæ; median carina distinct, a little unevenly flexuous, scarcely subgibbose in front of the shoulders, a little elevated and posteriorly substraight on the apical process; pronotal process extended considerably beyond the posterior knee, the wings equaling the apex in length; anterior prozonal carinæ short and converging behind, posterior lateral carina distinct and double between the shoulders, the inner of these carinæ more distinct; humeral angles a little roundly sloping laterally; posterior inferior angle of the lateral lobe strongly produced externally into an acute spine, behind the spine smoothly and obliquely truncate, the anterior margin of the spine oblique, posteriorly transversely straight; the inferior sinus of the posterior margin of the lateral lobe rather deeply incised above the posterior angle, the sub-humeral sinus scarcely indicated, the margin here being broadly curved for the reception of the elytra. Elytra very small and narrow. Anterior femora rather slender, carinæ substraight; posterior femora rather slender, the tibiæ scarcely at all ampliate apically, carinæ feebly multispinose, first and third article of posterior tarsi equal in length, pulvilli nearly equal in length, obtuse below.

Length body, ♀, 13 mm.; pronot., 15 mm.; post. fem., 9.5 mm.; entire length, 17 mm.

Locality, northeast Madagascar, Bay of Antongil. Mocquerys.

For the specimen in my collection I am indebted to Mr. Malcolm Burr.

EXPLANATION OF PLATE I.

All the figures are enlarged nearly four and a half diameters.

Fig. 1.	*Tetticerus*	*bigibbosus*	sp. n. gen. n. ♀.
Fig. 1a.	"	"	Vertex and lateral lobe of pronotum from above.
Fig. 1b.	"	"	Front view of face and pronotum.
Fig. 1c.	"	"	Posterior femora viewed from above.
Fig. 2.	*Notocerus*	*cornutus*	sp. n. gen. n. ♀.
Fig. 2a.	"	"	Front view of face and pronotum.
Fig. 3.	*Oxynotus*	*hastatus*	sp. n. gen. n. Dorsal view of pronotum and head. ♀.
Fig. 3a.	"	"	Profile view of head and part of pronotum.
Fig. 4.	*Hybotettix*	*humeralis*	sp. n. gen. n. Profile view. ♂.
Fig. 5.	*Telmatettix*	*burri*	sp. n. Dorsal view of body. ♂.
Fig. 5a.	"	"	Profile of head and part of pronotum.
Fig. 6.	*Cryptotettix*	*spinilobus*	sp. n. gen. n. ♀.
Fig. 6a.	"	"	Face and pronotum.
Fig. 6b.	"	"	Vertex and lateral lobe of pronotum.

A NEW SPECIES OF GOMPHUS.

JAMES TOUGH.

GOMPHUS CORNUTUS SP. NOV.

Length, ♂, 55-57 mm.; abdomen, 40-42 mm.; hind wing, 32-33 mm.

Yellowish green, with black and brown markings. Face and occiput yellowish green, eyes posteriorly black above, yellowish below, occiput distinctly convex, notched in center and fringed with black hairs, vertex and antennæ black. Prothorax black, with a geminate spot in center and a patch on each side yellowish. Thorax yellowish green, except a narrow band, indistinct or absent anteriorly, on each side of mid-dorsal carina, also except humeral and ante-humeral bands, and margins of first and second lateral sutures, all of

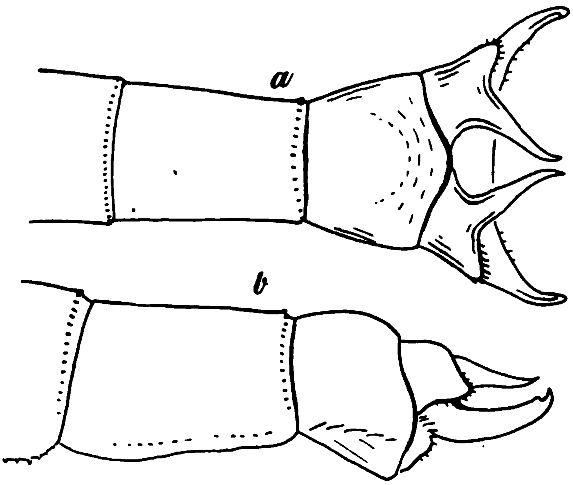


FIG. 1.—Abdominal appendages of male *Gomphus cornutus* sp. nov. (a) dorsal, (b) profile view.

which are brown. Legs black, front femora yellowish green below. Wings hyaline, with veins black, pterostigma yellowish, and costa yellowish green. Abdomen of uniform thickness, black, a dorsal stripe or spot on segments 1-8, small and basal on 8, and a small quadrangular spot on 10, yellowish; dorsum of 9 entirely black.

Appendages, ♂, see Figure 1, *a* and *b*. Superiors, dull yellowish; seen from above, internal branches produced inward and backward until they meet, acute and spinose at tip; external branches short, rather broad, and tipped with a blunt spine. Inferior appendage, seen from above, slightly longer than superiors, spreading, the distance from tip to tip of outer extremities being more than twice the width of the tenth abdominal segment at base. From side view the internal branches of superiors are seen to bear a conical tooth about midway between base and apex; the inferior curving upward gradually and each branch bearing a curved spine at tip.

Described from two male specimens, taken at Glen Ellyn, Du Page County, Illinois, one June 14, 1897, the other May 30, 1898, and now in the collections of the writer and Prof. J. S. Hine, of Columbus, Ohio, respectively.

This may possibly be the ♂ of *Gomphus crassus*, Hagen, of which only the ♀ is known.

INSECT DRIFT ON THE SHORE OF LAKE MICHIGAN.

JAMES G. NEEDHAM.

On Sunday, August 13, 1899, late in the afternoon, being in Lake Bluff, Illinois, and chancing to walk down on the Lake Michigan beach, I there came upon a casualty to insect life more sweeping and disastrous than any I had ever seen. At first glance, from the top of the "bluff," the beach seemed to have lost its accustomed whiteness; the light-colored sand seemed black. On nearer approach I was not a little surprised to see it thickly covered with black crickets, such as are common enough in the woods back from shore, but never seen here. There were millions of them, all up and down the beach. A moment's observation showed that there were many other insects present also, but the crickets were in predominant numbers, and "gave color to the occasion." They swarmed across the beach, slowly and laboriously moving toward the higher ground. There was a stiff breeze blowing on shore, and other swarms were being tossed upon the beach by the waves, and it was evident that this was all but the sequel to a recent storm.

On the evening of Friday, August 11th, a thunder-storm from the northwest had swept the western shore of the lake. In Chicago there was enough of a gale to blow down the iron framework of a church that was building, and in Milwaukee many chimneys were toppled over. At my home in Lake Forest, midway between these two cities, there was no gale—only a moderate breeze from the northwest.

Saturday, August 12th, was clear and comparatively calm.

Sunday, the 13th, was clear, with the wind shifted and blowing briskly from the northeast. The insects now coming ashore had, doubtless, been afloat on the surface of the lake for two days. The winds of the storm and the waters of the flood which followed it had carried out numberless individuals of many species; now wind and wave were bringing them back. The living were making such effort as they could to reach cover; the dead were being piled in a windrow at the farthest reach of the waves.

There are at certain times a few insects cast up by the waves habitually. In early summer there are the May beetles (*Lachnosterna spp.*), often in numbers; throughout the summer, strong-flying butterflies, chiefly the milkweed butterfly (*Anosia plexippus*); and on warm, hazy days in September and October, the grouse locusts (*Tettigidæ*), which then are swarming. Doubtless these fall exhausted upon the surface of the lake, having flown out of course and having been unable to reach land, or having been blown out by ordinary winds. That they have fallen alive into the water is evidenced by the condition in which they reach the shore — maimed, battered, half-drowned, but able to crawl upon the beach. Some of the stouter Rhyncophora, also (*e. g.*, *Sphenophorus*, *etc.*), which live in low vegetation along streams, are common objects on the beach. But these, I think, are oftener washed dead into the lake by its tributary streamlets, and having the lightness to avoid being buried in the sand, and the hardness long to resist decay, accumulate to a slight extent during the season.

Such an accumulation of insect drift as I found on the 13th of August, however, was evidently a casualty of unusual occurrence. I spent the remaining hour of sunlight that afternoon walking a mile to the northward along the beach, examining the wreckage. Only insects seemed to have suffered by the storm; no other dead animals were seen on the beach, save the occasional fishes which are always to be found there. Crickets outnumbered all the other insects put together, and were, apparently, of a single species (*Nemobius fasciatus*, DeG.). It is not quite clear why these should have been caught at all by the storm, living, as they do, under shelter in the woods; nor yet, why the larger species of crickets common in the same situations with this one should have entirely escaped.

Other Orthoptera, especially Acrididæ, were second in numerical importance, and among these the red-legged locust (*Melanoplus femur-rubrum*) was by far the commonest, though there were not a few of the larger *Melanoplus differentialis*. Tettigidæ were very numerous, also, but much less conspicuous. On the other hand, the Locustidæ, which were few, stood out conspicuously against the black background of the windrow — especially the katydids.

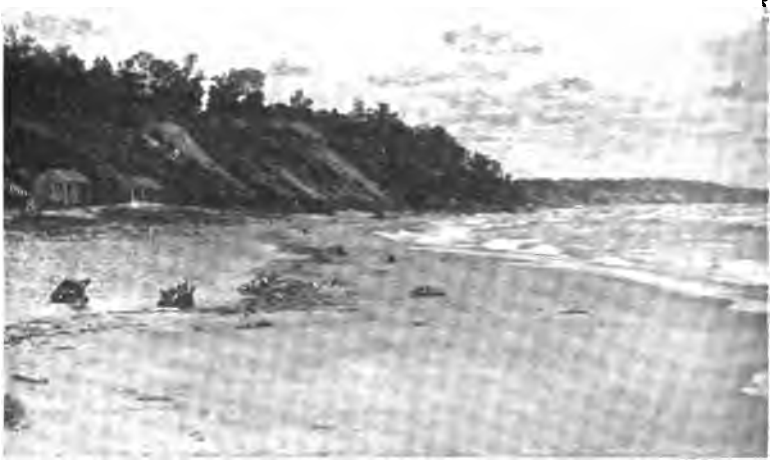
Dragonflies, also, were much in evidence; chiefly two big species (*Anax junius*, Dru., and *Æschna constricta*, Say.) in about equal numbers, with a few scattering specimens of *Libellula pulchella*, Dru., *Sympetrum rubicundulum*, Say., and *Enallagma* sp? and *Lestes* sp? Having a special interest in these, I counted in several places the numbers of them in distances of a few meters along the windrow, and found on an average forty-nine dragonflies per meter in length of it.

The Lepidoptera caught were chiefly strong-flying moths and butterflies, though of the latter all the species of Papilionidæ and Nymphalidæ common in this locality at the season seemed to be represented. These generally made the landing alive, though in a sadly battered condition. Every few feet along the windrow, perched on some high point, would be seen a poor butterfly trying vainly to use its ragged wings.

A single large robber fly (*Promachus vertebratus*, Say.) was very common. This, like the butterflies, tried to escape from the windrow by direct flight, and was much more often successful. I had not seen this species before during the season, though I had spent the greater part of the time afield.

No less surprising was the fatality of the storm to large aquatic insects — *Zaitha*, *Hydrophilus*, *Cybister*, etc. These were common — not a few chance dead specimens, but many, caught in the surf, unable to escape, some still feebly moving their legs about. Of the whirligigs (*Gyrinidæ*) and water striders (*Hydrobatidæ*) which are common at times on the surface of the lake, none were found in the drift. Such were the more striking features of the beach, which would have caught the attention of any entomological observer.

I left the shore that afternoon most regretfully, but returned to it next morning, three miles farther south, opposite my home in Lake Forest, and spent the day studying the windrow. The wind was still blowing from the northeast, and the waves were running about as on the day before, but they had ceased making accessions to the windrow, and had partly buried it in places beneath clean sand. Tattered butterflies were still clinging to the high places, and motionless ladybirds (*Coccinellidæ*) were sunning themselves upon the drift, a multitude of shining specks. The live crickets had left the open sand, but if one lifted a loose board anywhere upon the beach a black swarm of them would issue. The live grasshoppers were gone, too, and the leaves of the nearest vegetation—goldenrods, lupine, cockle-bur and willow—already showed the effects of their sudden depredations. The insects in the windrow were nearly all dead or dying, and large numbers of foraging Carabidæ were among them, with fewer Silphidæ, Dermestidæ and Staphylinidæ.



Lake Michigan beach at Lake Forest, Ill., looking northward, August 13, 1899. The black drift line extending along the middle of the beach was composed almost entirely of insects. From a photograph by the author.

I followed the windrow (the part of it shown in the accompanying figure) for another mile, making a qualitative examination of its contents, noting the condition of the insects in it, and comparing with their condition on the day before. I was desirous of determining (1) what insects were caught by storm and flood in any considerable numbers, and (2) to what extent they were killed, to what extent only removed to a new location. The following table contains in general terms my estimate of the more tangible results of the storm upon the insect life of the west shore. While it is only an estimate, it is based on as careful observations as were, under the circumstances, possible:

Orders.	Lesser Groups.	Condition on Approaching Shore.	Finally Killed. Per cent.
Orthoptera	Gryllidæ—crickets	Mostly alive	50
	Acrididæ	Mostly alive	50
	Tettigidæ—grouse locusts	All alive	---
	Locustidæ—meadow grasshoppers and katydids	Few alive	100
Odonata	Dragonflies	None alive	100
Lepidoptera	Butterflies and Moths	Mostly alive*	100
Coleoptera	Coccinellidæ—lady birds	A few dead	5
	Scarabæidæ, Chrysomelidæ and Carabidæ†	Many dead	75
Diptera	Asilidæ (1 sp.)—robber flies	Mostly alive	40
	Bombyliidæ and Muscidæ	All dead	100
Hymenoptera	Bumble-bees and Wasps	All dead	100
Hemiptera	Pentatomidæ—stink bugs	Mostly dead	100
	Belostomidæ—water bugs	Few dead, but fewer uninjured	90
Trichoptera	*Glossosoma sp?*—caddice fly	Mostly alive	10

Other orders were unrepresented in the drift, so far as I observed.

Finally, I gathered about a liter of the drifted material from the windrow (it consisted only of insects intermixed with a considerable quantity of cinder flotsam from the lake steamers), scooping it up with a trowel, and made a quantitative examination of it. This was not a fair sample, being too little; and numerous species observed in the windrow here and there were not found in the sample; but it was all I had time for counting. It contained the following:

---

*But with wings ruined for flight; ultimately the victims of predatory foes.

†Only the large species of Carabidæ mentioned in the succeeding list are intended here; the numerous, foraging, lesser Carabidæ found on the 13th were not observed on the 12th, showed no signs of having been through the surf, and the presumption is that they had come in later for the spoils.

2520 crickets (*Nemobius fasciatus*, DeG.); 49% males.
601 red-legged locusts (*Melanoplus femur-rubrum*, DeG.); 58% males.
85 other acrididæ (mostly *Melanoplus differentialis*, Thom).
85 Tettigidæ, of the following four species, of which the first was by far the most abundant; about 40% males:
  Tettigidea pennata, Morse.
  Tettigidea lateralis, Say.
  Tettix ornatus, Say.
  Tettix morsei, Hancock.
75 dragonflies, of which more than 75% were males:
  40 *Anax junius*, Dru.
  35 *Æschna constricta*, Say.
15 butterflies of 4 species:
  Anosia plexippus.
  Pieris rapæ, Linn.
  Polygonia interrogationis, Fabr.?
  Argynnis sp?
30 moths, in very bad condition, among which were the following:
  Phlegethontius celeus, Hübn.
  Utetheisa bella, Linn.
  Smerinthus sp?
  Leucania unipuncta, Haw.
  Homoptera sp?
25 ground beetles, battered in the surf:
  16 *Harpalus caliginosus*, Fabr.
  9 *Calosoma calidum*, Fabr.
75 lesser, foraging, Carabidæ, of at least 9 species.
6 big Staphylinids; *Creophilus villosus*, Grav.
4 *Necrophorus marginatus*, Fabr.
15 Scarabæids, mostly *Ligyrus relictus*, Say.
14 Rhyncophora, mostly *Sphenophorus pertinax*, Oliv.
5 *Hydrophilus triangularis*, Say.
5 Dytiscidæ:
  2 *Cybister fimbriolatus*, Say.
  3 *Hydaticus piceus*, Lec.
5 Colorado potato beetles (*Doryphora 10 lineata*, Say.).
31 other Chrysomelidæ.*
35 Coccinellidæ, of several common species.*

*Undetermined, but preserved for reference in case of inquiry.

- A number of Micro-Coleoptera.[*]
- 30 robber flies (*Promachus vertebratus*, Say.).
- 3 bee flies (*Exoprosopa fasciata*, Macq.[†]
- 16 Muscidæ, of several species.
- 10 bumble-bees:
  - 8 *Bombus americanorum*, Fabr.
  - 2 *Apathus elatus*, Fabr.
- 21 wasps of the following species:
  - *Tachysphex quebecensis*, Prov.
  - *Saluis fulvicornis*, Cr.
  - *Hemipogonius comparatus*, Sm.
  - *Polistes bellicosus*, Cr.
  - *Odynerus foraminatus*, Sauss.
  - *Odynerus abnormis*, Say.
  - *Myzine sex-cinctus*, Fabr.
  - *Tiphia quinque-cincta*, Ashm. MS.
- 30 Hemiptera, of three species:
  - *Podisus spinosus*, Dall.
  - *Podisus cynicus*, Say.
  - *Cænus delius*, Say.
- 11 water bugs (*Zaitha fusciventris*, Stahl.).
- 1 *Coriscus ferus*, Linn.
- 16 caddice flies (*Glossosoma sp?*)

How did all these insects get out into the lake? The aquatic species were, doubtless, carried out by the floods; the dragonflies and butterflies, by the winds. As to the others, the case is not quite so clear. They may have been first blown out by the wind, and afterward beaten down by the rain if flying, or they may have first been dislodged by the rain, and afterward carried out by the floods. It is not a matter for speculation, but for observation, when the rare opportunity offers. Doubtless, wind and water worked together, after a hot, sunshiny afternoon immediately preceding the storm had called the insects away from their safe retreats.

Two facts may be noted in conclusion, which were evidenced by the study of the drift:

1. The species found in it were nearly all present in very great numbers: sometimes in such numbers as to suggest how inconceivably numerous in individuals an insect species may be. Twenty-five hundred and twenty crickets per meter, and

---

[*] Knowing nothing of the habits of these, I could not tell whether they belonged to the drift or to the beach; therefore, have simply preserved them.

[†] Another species of this genus, *E. fascipennis*, Say., which lives on the beach and is common there, was not found in the drift.

the drift line perhaps fifty miles, perhaps a hundred miles long! I really thought to find, after counting the individuals of *Anax* and *Æschna*, and making a few moderate estimates, that these dragonflies must be much less common during the remainder of the season, but when I went out to their meadow foraging grounds the next afternoon they were flying there as thickly as I had ever seen them.

There was no apparent reason why certain species should have been caught by the storm, while other closely related and equally abundant species escaped altogether.

2. The species were nearly all the dominant ones in their respective groups: not the unfit, but the fittest of their kind. There is a proverb among the people to this effect: Good swimmers get drowned. Perhaps it is so with insects. Weaker species, feeling their limitations and keeping in safe places, may escape casualties to which stronger and more venturesome ones occasionally fall victims. If in times past casualties akin to this storm have had a part in bringing together the insects which we now find as fossils, the evidences of specialization which we so often find among them should be the less surprising.

NOTE.—For help very generously given me in the determination of the names of insects cited in the foregoing paper, I am under obligation to a number of gentlemen, as follows: Coleoptera, Mr. Samuel Henshaw; cricket, Mr. Samuel H. Scudder; Tettigidæ, Dr. J. L. Hancock; moths, Professor John B. Smith; Hymenoptera, Mr. W. H. Ashmead; Diptera, Mr. W. D. Coquillet; Hemiptera, Mr. O. Heidemann.

THE ARGYNNIDS OF NORTH AMERICA.*

ARTHUR J. SNYDER.

In no genus of North American diurnals are greater variations or more remarkable likenesses and unlikenesses to be found than among the *Argynnids.* Those who have studied the genus for years have sometimes contradicted themselves and have often found it necessary to retract statements made in their earlier writings, because extended observations proved their surmises untrue. Competent authors living at some distance from one another have described the same species under different names. Names have been transferred from one species to another, only to be returned, and supposed species have proven only remarkable variations.

Authors do not agree as to the boundaries or extent of the genus, and some, even among recent writers, have removed the smaller members, and with insufficient ground for so doing have given to this group the generic name *Brenthis.* According to one author, the genus *Argynnis* is divided, because of an insignificant variation in the venation of the wings, a short basal spur or branch of the median vein of the fore wing being present in the *Argynnids* and absent in the *Brenthis* group. According to another writer, vein iii_2 of the fore wing arises from the apex of the discal cell in *Argynnids*, and beyond the apex of discal cell in the *Brenthis* group.

Whether the view here taken be right or wrong, such hair-splitting distinctions do not appear to the writer as either scientific or practical.

Argynnids may be found from Florida to Alaska, from California to Greenland, from Atlantic to Pacific, and from sea-level to the tops of some of the higher peaks of the Rocky

---

***Read before the Chicago Entomological Society, April, 1897, and subsequently revised to date.**

Mountains. The genus is native to the north temperate and frigid zones, but I think is never found in the tropics.

Most writers have seemingly ignored the wide distribution of the members of the genus, and have taken little account of the fact that butterflies migrate from east to west or the reverse, and also from north to south or the reverse.

It is not known that when the sexes of so-called different species pair the offspring are always barren, or that they are always like either parent. In fact, many intergrades have been found.

The writer has on several occasions taken the sexes of different species *in coitu*, and from personal observation satisfied himself that the *Argynnids* are polygamous in their habits. Somewhat similar species are frequently found in the same locality, and with them examples which are clearly varieties or intergrades. The one point that remains unproved is whether the offspring resulting from hybridism are able to produce and do produce their kind, or are sterile and produce no offspring.

Another fact generally overlooked is, that almost without doubt there are dimorphic males and females of some species of *Argynnis*. There is little question of the fact that there are two forms of the female of *cybele*, or else *leto* females associate with the males of *cybele*. *Artonis* and *eurynome* cohabit, also *eurynome* and *clio*. The same is undoubtedly true of several other species. I believe that at least two of our so-called species are in reality dimorphic males of species previously described.

When thorough exploration has been made of the overlapping territories in which eastern and western, northern and southern species meet, revelations are sure to follow which will startle those who have hastily named new species. The student of *Argynnids* should secure a large series of each species from every locality.

Whether varieties due to geographical distribution are worthy names is a matter for scientists to determine. Certain it is, that there is a northern and a southern form of *eurynome*, and probably an eastern and a western form. The same is true of other species, and when the evidence is all in it would seem a wise plan to drop all but one specific name for such so-called species and to designate the varieties by significant names.

Before continuing the discussion as to species, it may be well to define the idea we maintain as to the frequently argued question, "What constitutes a species?" Professor Comstock, in his "Manual for the Study of Insects," page 3, says: "Roughly speaking, a species is a collection of individuals which resemble each other as closely as the offspring of a single parent. Unfortunately, this mode of defining the limits of a species cannot be depended upon. Many instances are known where forms of animals or plants living in widely separated regions differ so greatly that they have been considered distinct species until more extended collections in the intermediate regions have brought to light series of intermediate forms which connect the two so-called species so closely that it is impossible to say where the one ends and the other begins. The only definite way of determining whether two forms are specifically distinct is to determine whether they naturally interbreed or not. . . . . Except in the case of very closely allied species, the pairing of individuals of different species results in no offspring, or in production of sterile offspring."

It is to be regretted that the original ancestors of the much abused group of insects we are now discussing left so few evidences of their existence in the rocks. Lacking both ends of the history (I am of the opinion that there are yet species undiscovered), the only thing to do is to begin with the species nearest at hand and work both ways. The ultimate end of study and accumulation of the species and varieties from all the localities in which *Argynnids* are found must result in a thorough revision of the genus.

Although the writer has seen Mr. W. H. Edwards' types of *Argynnids*, which are now in the possession of Dr. Holland, director of the Carnegie Museum, at Pittsburg, Pennsylvania, the types in Dr. Strecker's collection at Reading, Pennsylvania, those in the Philadelphia Academy of Sciences, and in the private collection of Dr. Henry Skinner, of Philadelphia, the types of *charlottii* and the large series representing nearly all the members of the genus in the collection of Dr. William Barnes, at Decatur, Illinois, so that he may say he has seen practically all the types of North American *Argynnids*, and although he has seen more than thirty species alive and studied them, with their varieties, in their habitat, he feels that he would not be justified in attempting a complete revision of the genus until some of the disputed questions are decided and many of the intermediate gaps now missing are filled. Too little is now known of the western, northern, and alpine forms, and of the effects of interbreeding, geographical distribution, and altitude.

The latest check list of North American Lepidoptera, and the one in most general use among entomologists of the United States, was edited by Professor John B. Smith in 1891. In the preface to this work Professor Smith acknowledges the coöperation of Dr. Henry Skinner, and states that the synonomy connects with Mr. W. H. Edwards' catalogue of 1884.

In this list of 1891 are fifty-six species, nine varieties, and three aberrations of the genus *Argynnis*. Since the publication of this list Mr. W. H. Edwards has described three species. *Argynnis oweni* and *cornelia* were described in "*Canadian Entomologist*," and in "*Entomological News*," Volume VI, plate 12, both species are figured. *Argynnis astarte*, which has been described several times, was mentioned by Mr. Edwards in "*Canadian Entomologist*," Volume XXIII, page 198, 1891, and also in Volume III of the "*Butterflies of North America*." In "*Canadian Entomologist*," Volume XXIX, page 39, Dr. William Barnes describes *Argynnis charlottii*. *Argynnis snyderi* and *platina* were described by Dr. Henry Skinner in "*Canadian Entomologist*," Volume XXIX, page 154, 1897. Dr. Holland described *Argynnis coerulescens*, a variety of *nitocris*, in "*Entomological News*," Volume XI, page 332, 1900.

This makes the sum total of supposed species sixty-four and varieties ten. It seems that there is sufficient proof to justify reducing this number to fifty-seven species and fifteen varieties; hence only that number appear in the following list.

There are at least four other species, so-called, which the writer believes are nothing more than varieties, but the proof is not yet complete.

I would also suggest that *oweni*, *montivaga*, and *arge* are subject to doubt. The reasons are, *oweni* has many intergrades which cannot be separated from *hippolyta*. (See article by Dr. Barnes in January, 1900, *Entomological News*.) The writer has taken all varieties of *arge*, and some cannot be distinguished from *eurynome*. No one seems to know *montivaga*. It cannot be separated from others.

Any one who examines Mr. Edwards's types* will see at once that his species are separable, but had Mr. Edwards seen all the forms which have since been taken, he would undoubtedly acknowledge that some of his supposed species are at best varietal forms. The infinite number of these forms make it impossible for any one to draw the line sharply and say where one species ends and another begins.

For convenience of arrangement in our cabinets the genus *Argynnis* may well be divided into six groups.

I have selected for the center of each group a well-defined species, and arranged other species in what seems their natural order. The sixth group I have not studied sufficiently to hazard an original arrangement; therefore I have taken the list exactly as given in Dr. Henry Skinner's "Synonymic Catalogue of the North American Rhopalocera." It is needless to add that in the second Group additional revision is needed, but more collecting and study of live forms must precede a final arrangement.

As to aberrations, any one who has collected for five years should be able to produce several, and it does not seem best to name them, and so add to the burden of our already confused literature.

So far as known, the food plant of the *Argynnids* is the violet. A few of the alpine species are supposed to feed upon other plants, but I have found no proof of this. Usually the eggs are deposited on the underside of leaves and stems of the violet, but some western species attach the eggs to bits of bark or dead twigs near violets, and some seem to drop the eggs almost without discrimination.

---

*Mr. Edwards's types are still preserved, or were eighteen months ago, with his own handwriting upon the labels.

Eggs may easily be secured by confining the females over violets which have been transplanted. The rearing of the larvæ, however, is a more difficult process, for the reason that they usually hibernate during the winter, becoming lethargic a few days after emerging from the egg. Mr. Edwards, who has had much experience in the rearing of larvæ, says the easiest and safest way to keep hibernating larvæ is to place them in cold storage until the food plant can be started in the spring.

THE GENUS ARGYNNIS, FABRICIUS.

GROUP I, DIANA GROUP.

- Idalia, Drury.
  - aber. Ashtaroth, Fisher.
- Diana, Cram.
- Nokomis, Edw.
- Nitocris, Edw.
  - var. Coerulescens, Holland.
- Leto, Behr.
- Charlottii, Barnes.
- Cybele, Fab.
  - var. Carpenterii, Edw.
  - aber. Baal, Streck.
- Aphrodite, Fab.
  - var. Alcestis, Edw.
  - var. Cypris, Edw.

GROUP II, MONTICOLA GROUP.

- Nausicaa, Edw.
- Lais, Edw.
- Atlantis, Edw.
- Cornelia, Edw.
- Electra, Edw.
- Columbia, H. Edw.
- Hesperis, Edw.
- Hippolyta, Edw.
- Oweni, Edw.
- Bremnerii, Edw.
- Zerene, Bd.
- Monticola, Behr.
  - var. Purpurascens, H. Edw.
- Rhodope, Edw.
- Behrensii, Edw.
- Halcyone, Edw.
- Platina, Skinner.
- Coronis, Behr.
- Callippe, Bd.

GROUP III, EDWARDSII GROUP.

- Snyderi, Skinner.
- Edwardsii, Reak.
- Nevadensis, Edw.
  - var. Meadii, Edw.

GROUP IV, SEMIRAMIS GROUP.

- Chitone, Edw.
- Liliana, H. Edw.
  - aber. Baroni, Edw.
- Montivaga, Behr.
- Rupestris, Behr.
  - var. Irene, Bd.
- Laura, Edw.
- Egleis, Bd.
- Inornata, Edw.
- Semiramis, Edw.
- Adiante, Bd.
- Atossa, Edw.

GROUP V, EURYNOME GROUP.

EURYNOME, Edw.
  Form BISCHOFFI, Edw., a northern var.
  Form ARTONIS, Edw., a southwestern var.
  Form CLIO, Edw., a northwestern var.
ARGE, Strecker; intergrades with EURYNOME.

GROUP VI, MYRINA GROUP.

MYRINA, Cram.
TRICLARIS, Hub.
HELENA, Edw.
MONTINUS, Scud.
CHARICLEA, Schneid.
  var. (a) ARCTICA, Zett.
  var. (b) OBSCURA, McLach.
BUTLERII, Edw.
BOISDUVALLII, Dup.
FREIJA, Thumb.
IMPROBA, Butl.
POLARIS, Bdl.
YOUNGI, Holland.
FRIGGA, Thumb.
  var. SAGA, Kaden MSS.
BELLONA, Fabr.
EPITHORE, Bd.
  var. KREIMHILD, Streck.
ALBERTA, Edw.
ASTARTE, Doubl.–Hew.

NOTES ON INDIVIDUAL SPECIES.

IDALIA, Dru., is abundant in the vicinity of Austin, Ill. Its northern limit is Maine, its southern Florida, its western Nebraska, and its southwestern Arkansas. One aberration, *ashtaroth*, Fisher, has been described. This aberration was first called *astarte*, but the name was subsequently changed by the describer. Other aberrations are not infrequent. The species is distinct, easily separable from other members of the genus.

DIANA, Cram., is the largest and most noted of its genus for beauty. The handsome female, expanding four inches, is perhaps the most striking of our eastern North American butterflies. It must be seen alive to be fully appreciated, some of its colors seeming to depart with life. Its northern limit in Illinois is Clay County. It ranges to the southwest into Arkansas, southeast to Florida. It is probably most common in the middle Atlantic States, Virginia, West Virginia, North Carolina and Tennessee.

NOKOMIS, Edw., is properly placed between *diana* and *leto*. It is a southwestern form seldom seen alive or in collections. It has been taken in northern Arizona and southern Utah.

NITOCRIS, Edw., is another southwestern species unknown to most collectors. It seems close to *nokomis*, and may prove a variety. It is found in southern Arizona and Nevada. Var. *cœrulescens*, Holland, was taken in the State of Chihuahua, Mexico, in September, 1899. The male is the same as *nitocris*, but the females vary in having the quadrate limbal markings on the primaries and secondaries blue, of the same tint as *diana*.

LETO, Behr., is a handsome western species. The females are totally unlike the males, and an inexperienced collector would hardly place them even in the genus *Argynnis*. *Leto* ranges from Northwest Territory southward to central or southern Utah. It probably occurs in western Colorado, and ranges westward into California.

CHARLOTTII, Barnes, is a small edition of *leto*, yet distinct. It seems to be the connecting link between *leto* and *cybele*. The types are from western Colorado. It ranges north to Yellowstone Park and west to a point unknown.

CYBELE, Fab., our most common species in this vicinity, ranges over the eastern portion of North America. Cybele is replaced west of the Continental Divide by the form or variety *carpenterii*, Edw. A male *cybele* in the writer's collection which was taken in Canada measures two inches; a female from Tennessee expands a trifle over 3.5 inches. Aberrations are not infrequent. Several have been taken in the vicinity of Chicago. One has been named *baal* by Mr. Strecker. *Leto* is considered by some lepidopterists a western form of *cybele* (*Boisd. Lep. Cat.* p. 60, 1869, Strecker *Cat.*, page 111, 187; Skinner, *Ent. News*, Vol. 4, p. 318.) Leto as found in Utah is distinctly different from *cybele* in both sexes. A single female found in Yellowstone Park by the writer in 1895 varies considerably from the Utah form, and approaches *charlottii*. Two females of *cybele* in the collection of J. L. Healy of Chicago, which were taken at Schoolcraft, Mich., in 1895, by Mr. William S. Bates, so closely resembles *leto* as to startle one. With these peculiar females were taken the ordinary cybele males. Leto is reported as having been taken in Minnesota, but I find no proof. In the collection of Dr. Skinner of Philadelphia, Pa., are two females of *cybele*, one taken at Binghamton, N. Y., the other from Spanish River, on Canada shore of Lake Huron, which closely resembles *leto*. Mrs. Herring, of Plainfield, N. J., has examples of the same form, and, I believe, is the one who captured them. *Leto* and *cybele* are sufficiently unlike to remain in our lists as distinct species.

APHRODITE, Fab., absolutely intergrades with var. *alcestis*. It is found in the eastern portion of North America, and as far west as Montana. The main distinguishing point between *aphrodite* and *alcestis* seems to be the presence of a buff band on underside of secondaries in *aphrodite*, and the absence of this band in *alcestis*. There is also a difference in the depth of color on upper surface, and the darker forms are sometimes considered as *alcestis*. The presence of a black dot near base of secondaries is considered by some as of specific value, but will not hold, as it is sometimes found in both forms. In specimens from the northwest (Canada) the band is usually distinct, and these would seem to be the true *aphrodite*. They are also smaller and lighter in ground color. The largest and handsomest *aphrodite* I have seen are from the suburbs of Chicago, especially from Glen Ellyn and Austin. Males vary more than the females. In my own collection are arranged a series with typical *aphrodite* at the top, typical *alcestis* at the bottom and the intergrades between.

Cypris, Edw., is the western form, Rocky Mountain form, of *aphrodite*. Mr. Edwards has bred *cypris*, and says that at maturity the larvæ are decidedly unlike those of *aphrodite*.

NAUSICAA, Edw., is an Arizona species said to be found further to the southwest than other members of the genus. It is unknown to most collections.

LAIS, Edw., is a British America species common at Calgary, Northwest Territory.

ATLANTIS, Edw., claims as its home the northeastern portion of North America. It is abundant in the White Mountains, one writer stating that it could be taken from the train with a net, as great numbers were startled by the noise of the train in passing.

CORNELIA, Edw., was taken by Professor Owen and Mr. Bruce in the vicinity of Ouray and Manitou, Col. It has also been taken by the writer in Utah. The species is close to other species and hard to separate.

ELECTRA, Edw., resembles *atlantis*, is not well known by the writer, and is seldom to be seen in collections. It is found in Colorado, New Mexico, Montana and Wyoming.

COLUMBIA, H. Edw. Types are from Lakes Lahache and Quesnelle, British Columbia.

HESPERIS, Edw., is found in Colorado, Utah, Montana and Wyoming.

HIPPOLYTA, Edw., is a decidedly variable species, and, according to Dr. Barnes, can hardly be separated from the following species. It is found in Oregon, Idaho and Wyoming.

OWENI, Edw., was described from a long series taken by Professor Owen on Mt. Shasta, California, at an elevation of 7,500 feet. Mr. Edwards says that "the upper side of the female is very close to *behrensii* in the color and weight of the black markings. In the male of that species the markings are much lighter than in the present one. On the underside both sexes of *behrensii* have the ground of hind wings solid ferruginous, not mottled as in *oweni*." This species has also been taken in Idaho, and by the writer in Utah. As suggested elsewhere, it may yet prove a form of *hyppolyta*.

BREMNERII, Edw., is a northwestern species found in British Columbia, Washington and Oregon.

ZERENE, Pd., is, next to *monticola*, the center of this group. It is found in California and Nevada.

MONTICOLA, Behr., is found in California, Oregon, Nevada, Montana and British America. The peculiar reddish color of the underside which Dr. Holland mentions as being inclined to pink, and the purplish gray ground color on the underside of hind wings, are characteristic of this and the preceding species. One who has seen the underside of either *zerene* or *monticola* will not be likely to forget the species.

Var. *purpurascens*, H. Edw., was named on account of the distinctly purplish color of the underside. The best examples of this variety come from Soda Springs, Cal.

RHODOPE, Edw., approaches *monticola* from the north. It is much darker, with colors more suffused, as is usually the case with northern species. It is a handsome butterfly found in British Columbia, Montana and Wyoming.

BEHRENSII, Edw., was first taken in California, but has since been found as far east as Colorado.

HALCYONE, Edw., is found in Colorado about Manitou, and thence westward into Utah and north into Wyoming. It is not rare about the Half-way House on Pike's Peak the latter part of June.

PLATINA, Skinner, is easily recognized by the peculiar luster and the size of spots on underside of fore wings, as well as by the general appearance and markings above. The types were taken by the writer in Utah, and the species is common about Salt Lake City and Ogden from the first of July to September. There are probably two broods each season. *Platina* has also been taken in Idaho and Washington.

CORONIS, Behr., was described as No. 2, *Proc. Cal. Acad. Sci.*, 1862; by Mr. W. H. Edwards in *Proc. Ent. Soc. Phila.*, 1864; was called *juba* by Boisduval, *Lep. de la Cal.*, 1869; female of *nevadensis*, Edw., *But. N. A. I.*, Pl. 33, Figs. 3, 4, 1871. This frequent cause of additions to the synonymy is said to be exceedingly variable as to size and coloration. *Coronis* ranges from Kern County, Cal., east and northward through Utah and Washington into British Columbia.

CALLIPPE, Bdv., is a California species not likely to be confounded with any other species unless it be *coronis*, which it imitates closely in general markings, but from which it may be easily known because of its general suffused appearance, as though the underside were very dark and the color showed through. It is common about San Francisco, and is found in low, wind-protected valleys.

SNYDERI, Skinner, until the females were discovered in 1895, was supposed by some to be the Utah form of *coronis*. It belongs with the *edwardsii* group, the females when alive or fresh having a decidedly greenish tint on underside. The species is common locally about Salt Lake City and Ogden and ranges northward into Idaho. Mr. Browning of Salt Lake City tells me that in August of 1899 numbers of this species came down from the mountains into the streets of the city, and were frequently seen in the gardens or along the sidewalks. It is found from July to September. Its usual habitat is some mountain glen at an elevation of 5,000 feet or more, where to see the handsome females flitting about in the sunlight or resting on the late summer flowers is a pleasing sight.

EDWARDSII, Reak., is a handsome species, also. notable for its heavy outer marginal lines on upper surface, which are entirely or almost confluent. The ground color is a rich brown. Below, the color is darker than in allied species, the black and silver markings forming a striking contrast, to which there is added an almost purple reflection in fresh specimens.

Edwardsii is found in Colorado about Manitou and thence northwestward into British America.

NEVADENSIS, Edw. The types of this species are from Virginia City, Nev. Most of the specimens I have seen are smaller than those of *meadii;* there is a different luster to the green underneath, and the black markings, while clearly cut, are not so heavy as in *meadii*. It is my opinion that the habitat of the species is Nevada, and that as it moved northward climatic and other causes produced the variety afterward described as *meadii*. Males of both forms are taken about Salt Lake City, but I am unable to separate the females, unless the lighter ones be *nevadensis* and the darker *meadii*. Colorado, Nevada, Idaho, Montana, Wyoming and British America are the habitats of *meadii*, and *nevadensis* belongs to the southern part of this region.

CHITONE, Edw., was common in 1899 about Salt Lake City. It is also found in Idaho, Nevada and southeastern California. The species is exceedingly variable on underside, while above the markings are fairly constant. Some specimens are silvered below, some partially so, and some totally without silver, seeming to verge into *rupestris.*

LILIANA and its var. *baroni*, Edw., are found in California and Utah. Although I have taken species so named, I do not feel that I know the species or that examples of the species do not blend into other species.

MONTIVAGA, Behr., is another doubtful species, or at least is little known. It is found in California, Nevada and Utah. In Utah it is found with *eurynome.*

RUPESTRIS, Behr., and *irene*, Bd., are found in California and Utah.

LAURA, Edw., belongs to California, Nevada and Utah.

EGLEIS, Bd., is found in California, Nevada and Utah. An Alpine form is found in the Sierra Nevada Mountains. In Utah the species is rather larger than the Nevada and California species. A male *eglesis* has been taken *in coitu* with what has been identified as female of *inornata.*

INORNATA, Edw., is found in California, Nevada and Utah. It is rare in collections. It may be known by the large size of the unsilvered spots below.

SEMIRAMIS, Edw., is a native of California, and not easily confounded with any other species. Mr. Edwards says of this species: "It is curious how the markings resemble two such different species as *adiante* (upper side), *coronis* (lower side)."

ADIANTE, Bdo., is also native to California. In general appearance above it resembles *semiramis*, but the spots are unsilvered.

ATOSSA, Edw., was discovered by Mr. H. K. Burrison in 1889 in southern California, July 4 to 8. Very few representatives of this species have been captured. It is the lightest in color and markings of all the *argynnids*, but is nearest to *adiante.* The black markings are very light, almost obsolete.

EURYNOME, Edw. The writer has captured not less than a thousand *eurynome*, and three or four hundred of the variety *artonis.* He has taken male *eurynome* with female *artonis* and female *eurynome* with male *artonis.* He has examined numerous intergrades, some partially silvered, some totally silvered, and some absolutely without silvering. Others have taken *clio* and *eurynome in coitu*, and the intergrades have also been taken. *Bischoffi* is doubtless a northern suffused form of *eurynome*, for as one traces the species north from Utah through Idaho, Wyoming and Montana into British America, *eurynome* becomes somewhat smaller and darker.

The following would, therefore, appear to be a better arrangement:

Argynnis eurynome, Edw.
  Form *bischoffi*, Edw., a northern variety.
  Form *artonis*, Edw., the Utah or southwestern variety.
  Form *clio*, Edw., a northwestern variety.
  Opis, a synonym of *clio.*
  Macaria, a synonym of *eurynome.*

ARGE, Strecker, is found in Caifornia, Oregon and Utah. There are numerous examples of this species which intergrade into *eurynome*. It is probably an alpine or extreme Western form of *eurynome*.

MYRINA, Cram., is too well known to need special remarks. I would therefore simply add Utah to the list of localities in which it is found. It was found in a moist pasture at an elevation of 6,500 feet in great numbers, and associated with it were *eurynome* and *leto*.

BELLONA, Fabr., the most common small *Argynnis* throughout the East, is quite well imitated in the West by *epithore* and its variety, *kreimhild*.

HELENA, Edw., is found from the Rocky Mountains westward. It has a habit peculiar to *Argynnids*. In Yellowstone Park, it was found flitting along the road after a shower, alighting in the road and spreading out its wings evidently to enjoy the sunshine.

MONTINUS, Scud., our noted White Mountain butterfly, "found only on Mt. Washington at certain elevations," is rare in most collectors' cabinets.

The writer acknowledges his indebtedness to Prof. G. H. French, Mr. W. H. Edwards, Dr. Henry Skinner and Dr. William Barnes for assistance in identifying species; to Dr. Hermann Strecker and Dr. W. J. Holland for permission to examine their types, and to the members of the Chicago Entomological Society for their encouragement and assistance.

BELVIDERE, ILLINOIS, March 8, 1900.